BULLETIN of The GEORGIA ACADEMY of SCIENCE

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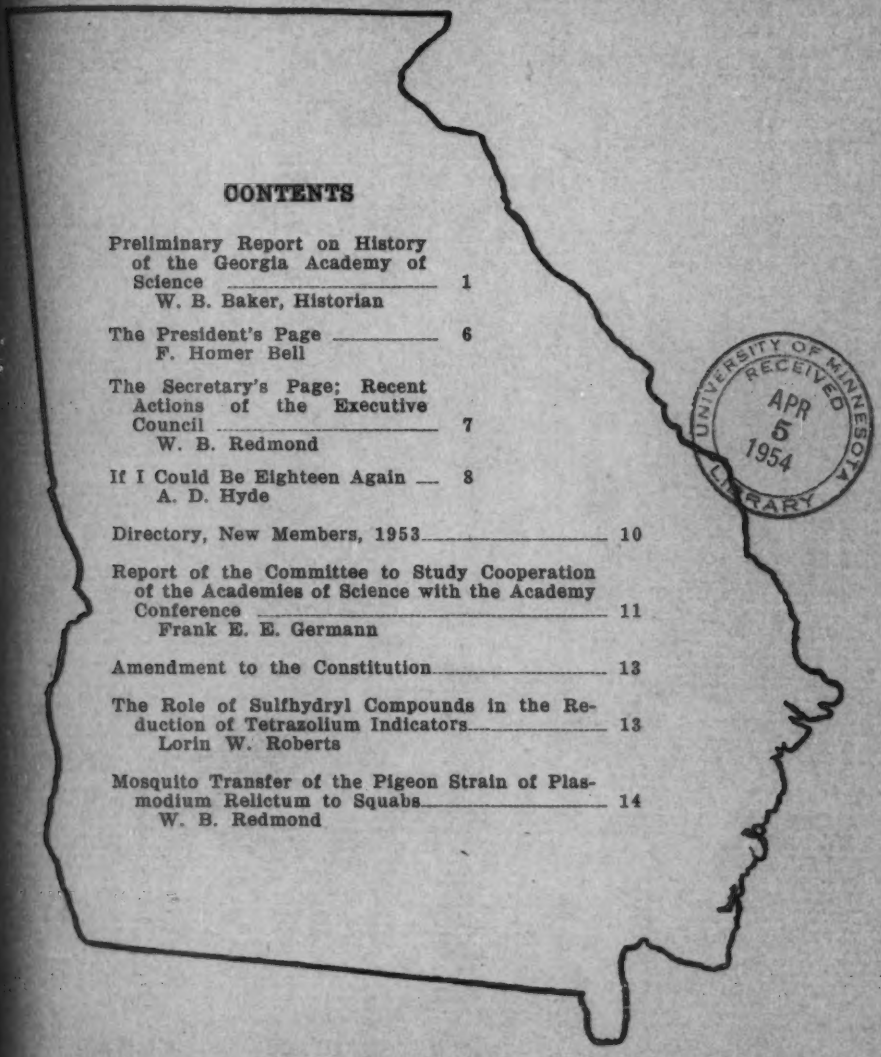

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BULLETIN OF GEORGIA ACADEMY OF SCIENCE

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Secretary, W. B. Redmond
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Edited by
W. B. Redmond

THE BULLETIN of the GEORGIA ACADEMY OF SCIENCE is published four times each year, in April, June, September and December and is sent without charge to all members of the Academy.

Articles to be published in the BULLETIN should be sent to the Secretary, Box 534, Emory University, Georgia. Reprints of articles will be furnished at cost.

REPORT OF HISTORIAN

Woolford B. Baker

Since your present historian was elected at the annual meeting in April 1950 he has concerned himself primarily with getting together as much data as possible regarding the Academy which might be of value in compiling a history of the organization.

This task has been completed with some degree of success and the material consisting of programs, minutes of annual meetings, correspondence of some of the past presidents, proceedings of the executive council meetings and the reports of the previous historians has been assembled and sorted into proper files.

During the early period of the Academy's existence all records were kept by the secretary. In 1940 it was thought desirable to provide an additional officer, a historian, whose general duty would be to accumulate, file and digest the records of important activities carried on by the Academy during his term of office. Specific duties pertaining to the office were not defined and consequently no definite provision was made for any particular continuity in the records, nor any specific objective in compiling the data formulated. The first historian elected was Dr. R. P. Stephens who assumed the office in 1934 and served until 1944 when he was succeeded by Dr. Robert C. Rhodes. Upon the death of Dr. Rhodes in 1948, Dr. W. B. Redmond was elected and served until the present historian was elected in 1950.

In 1951 it was proposed by the executive council that the writing of a complete and comprehensive history of the Academy be begun with the ultimate aim of presenting such a history to the members of the Academy in printed form. The suggestion was unanimously adopted and the present historian undertook the project.

Obviously there were many difficulties encountered. The only continuous records were found in the files of the secretary, but these did not include many of the interesting data which can only be found in files of personal correspondence of the Past Presidents, other officers and members. A continued search for this type of material will be made and it is hoped that gaps which now exist may be filled so that the background material can be made as complete as possible.

Since the Academy is now in its thirty-second year and only a few of its charter members are still living, it seems all the more necessary that a permanent history be completed as soon as possible, while many of the scattered records are still available. It is the hope of the historian that any material pertaining to the Academy now on file in individual offices be sent to the secretary to be drawn upon in compiling the final printed history.

During a study of the files accumulated to date it seems that the history of the Academy may be divided into three rather distinct periods. I have prepared my outline for further development according to the major events taking place during each of these periods.

PERIOD I. 1922-1932. THE PERIOD OF ORGANIZATION.

PERIOD II. 1932-1942. PERIOD OF GROWTH AND DEVELOPMENT.

PERIOD III. 1942-1952. PERIOD OF EXPANDING ACTIVITIES.

Suggestions as to revision of these arbitrary designations will be welcomed.

A preliminary discussion of Period I, 1922-1932 is published in the present issue of the Bulletin.

PRELIMINARY REPORT ON HISTORY OF THE GEORGIA ACADEMY OF SCIENCE

W. B. Baker, Historian

The Georgia Academy of Science owes its origin to an action taken in the spring of 1922 by the Scientific Society of the University of Georgia. A committee was appointed by this body to investigate the possibility of setting up a state-wide organization. The committee reported favorably on the idea and was instructed to issue an invitation to a selected group of scientists in the state, representing the Universities, the Experiment Stations, Engineering and Industry, to meet with the committee at the University of Georgia on March 25, 1922, for further study leading to the organization of "a society of scientists resident in the

State of Georgia." The initial meeting of the "delegates" was held in the library of the Chemistry Department of the University and Dr. R. P. Stephens was elected acting president and Dr. Henry Fox as acting secretary. A formal meeting was then called by Pres. Stephens for 10:30 a.m. for consideration of the business at hand. The following persons were present:

Dr. G. H. Boggs, Chemistry, Georgia School of Technology.

Dr. T. P. Branch, Civil Engineering, Georgia School of Technology.

Prof. L. M. Carter, Agricultural Chemistry, University of Georgia.

Prof. T. W. Fitzgerald, Electrical Engineering, Georgia School of Technology.

Dr. C. R. Fountain, Physics, Mercer University.

Dr. Henry Fox, Biology, Mercer University.

Dr. B. M. Hall, Electrical Engineering, Atlanta, Georgia.

Prof. E. S. Heath, Botany, Oglethorpe University

Dr. L. L. Hendren, Physics, University of Georgia

Dr. B. B. Higgins, Botany, Georgia Experiment Station.

Dr. T. H. McHatton, Horticulture, University of Georgia.

Dr. W. S. Nelms, Physics, Emory University.

Prof. J. B. Peebles, Engineering, Emory University.

Dr. J. M. Reade, Botany, University of Georgia.

Dr. R. C. Rhodes, Biology, Emory University.

Prof. W. V. Skiles, Mathematics, Georgia School of Technology.

Dr. C. M. Snelling, Mathematics, University of Georgia.

Dr. R. P. Stephens, Mathematics, University of Georgia.

Dr. C. M. Strahan, Civil Engineering, University of Georgia.

Mr. H. P. Stuckey, Georgia Experiment Station.

Selected quotations from the minutes of this meeting indicate the serious purpose and attitude of the "delegates" as well as giving background for understanding some of the major problems which have arisen during the development of the policies and procedures of the Academy.

"Dr. Reade then announced that the first problem to be solved by the meeting related to the nature of the proposed organization. He stated that two types had been suggested, namely, either an open society to which every person engaged in scientific work of any kind in the State would be eligible for membership, or a limited organization in which the basis of eligibility for membership would be definite achievement in some branch of scientific activity. The type suggested in the original circular dispatched to the institutions represented was the latter of these two alternatives."

"Dr. Nelms moved the organization of an honorary society of limited membership in line with the suggestion in the original circular."

After a "long and animated discussion" the motion was finally submitted to vote and passed. A motion was then made and passed that the name adopted for the organization be "Georgia Academy of Science." The matter of procedure for election of members was then taken up together with the fixing of the number of members permitted until the "first regular meeting of the Academy." The number of members was set at fifty and the following motion determining the method for election of members adopted:

"the election of new members be by the Academy, provided a majority of the members be present and that at least two-thirds of those present vote."

It was then moved by Dr. Strahan and passed that

"the members in attendance organize themselves into the Georgia Academy of Science and that they constitute themselves Charter Members of the Academy."

In order to set up machinery for perfecting a permanent organization a temporary executive council of seven members was appointed to serve as a constitutional and nominating committee. It was further decided that this temporary council elect its "own chairman and secretary and that these act as chairman and secretary at the first regular meeting of the Academy." The fol-

lowing were members of the temporary executive council:

Dr. R. P. Stephens
Dr. Henry Fox
Dr. T. P. Branch
Dr. T. H. McHatton
Dr. G. H. Boggs
Dr. B. B. Higgins
Dr. W. S. Nelms

Dr. Stephens was elected chairman and Dr. Fox secretary of the council and hence became the first officers of the Georgia Academy of Science.

Many matters pertaining to the future organization of the Academy were discussed by the council members at their formal meeting at 2:00 p.m. on March 25, 1922, but three actions taken seem to be particularly significant:

"It was also suggested that steps be taken to apply during the summer to the State Legislature to pass an act legally establishing the present organization as the Georgia Academy of Science. It was felt that by so doing this the Academy would be in a position to serve the State in an advisory capacity in matters relative to the development of the natural resources of Georgia."

"It was moved and carried that the Executive Council be composed of seven members consisting of the president, vice-president, and secretary-treasurer and the last four vice-presidents of the Academy; also that any vacancies in the Council **ad interim** be filled by action of the Council."

"As regards the election of new members to the Academy it was decided (1) that the secretary supply copies of a list of the charter members of the Academy to the members of the committee; (2) that every member of the Academy be privileged to submit nominations to the committee; and (3) that memoranda of the candidates' attainments be required as a preliminary for election."

With the actions taken by the "delegates" and their duly constituted Council the Georgia Academy of Science was brought into being, and the decision was made to hold the first regular meeting sometime in the fall of 1922, the exact time and place to be determined by the Executive Council. These actions were taken sometime during the year and the first regular meeting was held December 1-2, 1922, in LeConte Hall at the University of Georgia in Athens, Ga., the meeting being called to order at 4:00 p.m. by Pres. R. P. Stephens.

According to the minutes of this the first annual meeting there were twenty members present and nine papers were read at the meeting held on Saturday morning. Of these it is interesting to note that four were presented by members of the Academy while five were given by visitors introduced to the Academy by sponsoring members. This seems to be significant since there was a feeling among the members that "nominations for membership be made only from persons who had previously appeared on the program of the Academy." Although this procedure was discussed at length at the business meeting no formal action was taken. It should be noted, however, that a study of the programs and the lists of new members from 1922 to 1934 indicates that such a policy was in general operative.

Summary of Programs, 1922-1934

Year	Total Number of Papers	By Members	By Visitors Introduced by Members
1922	9	4	5
1923	9	4	5
1924	15	10	5
1925	18	9	9
1926	23	8	15
1927	(This meeting postponed until Feb. 1928).		
1928	19	11	8
1929	22	18	4
1930	21	9	12
1931	24	12	12
1932	22	6	16
1933	33	17	16
1934	44	18	26

That considerable importance was attached to the presenting of prospective members to the Academy as a whole before they could be nominated is indicated by a motion made by Prof. Heath and passed at the sixth annual meeting in 1928 to the effect that the member sponsoring an individual "actually speak in introducing them." At the same meeting an amendment to the by-laws

as recommended by the Council provided that

> "No one shall be eligible to membership in the Academy until after he has presented a paper before the Academy."

The matter was at first tabled but was taken up the next day and it was voted to refer it back to the new Council for further consideration. However, a comparison of the names of persons introduced and those elected to membership indicates that this policy of selecting new members was generally followed until 1932 when it was voted to increase the limit of membership to a maximum of eighty-five. During 1933 eighteen members were elected. In 1934 the Executive Council recommended that the entire matter of membership be discussed with the possibility of opening the Academy to "persons in the State who are interested in science." Thus the first period in the history of the Academy was passed. It seems that this period might well be designated in the completed history of the Academy as **I. The Period of Organization, 1922-1932.**

In reading the minutes of the business meetings during this period of organization one is impressed by the fact that the individuals who formulated the early plans for the Academy and carried on its activities during the first ten years of its existence were dedicated to the establishment of an organization that would raise the standards of scientific achievement to high levels and wield a wholesome influence in promoting scientific activity throughout the state. It was generally felt that this could best be accomplished by keeping the membership small and insisting that every member be active in promoting the interests of the organization and of science in general. During the early years a roll of members was called at each meeting and absences noted, since the by-laws provided that a member be dropped from the roll for failure to attend more than two annual meetings in succession without a valid excuse. Research was encouraged, the advantages of Academy membership were presented to students and younger workers in the sciences, and programs were arranged that tended to represent interrelationships between the different fields of science. The spirit of cooperation between workers in different institutions and in different fields of science was encouraged. The following paragraph from the report of the first Historian of the Academy, Dr. R. P. Stephens, is significant:

> At the time of the organization of the Academy, there were very few contacts made by scitists outside their own institutions. The national societies usually met at such distances that the Georgian could seldom attend; he thus had few national contacts. But equally bad, there was little incentive for him to meet the members of the same department in a sister institution. It is true that other agencies have assisted in this formation of good fellowship. Our Southeastern Section of the Mathematical Association of America has done a great work; the Georgia Chapter of the American Chemical Society, and others, have helped. But none has helped like the Georgia Academy's meetings where, for instance, the chemist not only meets other chemists, but also the physicist and the biologists.

It is difficult to determine from the records just who were considered charter members of the Academy. Twenty names appear in the minutes of the organizational meetings. Six men were voted on by ballot sent by mail on October 30, 1922, and all were elected as charter members. Four of these appear on the list of members attending the first annual meeting while two others appear on the application for a charter but do not appear elsewhere. From these lists Dr. Rhodes, who was Historian at the time of the twenty-fifth anniversary meeting honoring the charter members and past presidents of the Academy, compiled a list of charter members, twenty-six in number. Of these only nine are still living (1954).

Assuming the accuracy of the twenty-six names as charter members the increase in membership during the period 1922 to 1936 is as follows:

Year	Membership
1922	26
1923	35

1924	40
1925	42
1926	46
1927-28	53
1929	58
1930	59
1931	58
1932	59
1933	77*
1934	79
1935	86
1936	100

The membership was divided into eleven sections: (1) Agriculture; (2) Botany; (3) Chemistry; (4) Engineering; (5) Experimental Medicine; (6) Geology; (7) Mathematics; (8) Physics; (9) Psychology; (10) Zoology; (11) Miscellaneous. In 1932 the Psychology section was changed to Anthropology and Experimentaal Psychology. All sections met together for the reading of papers at the annual meetings until 1932 when separate groups were formed and met simultaneously for hearing papers. This custom has been continuous as the occasion demands. In 1953 papers were read in six separate sections.

In addition to the fact that the membership was to be limited during the period of organization provision was made that the various fields of science should have equal representation. Article II, Section 3 of the first Constitution adopted, reads:

> The number of active members shall be limited. Active members shall be chosen from the following groups,** but in such a way that the number from any group shall not exceed fifteen per cent of the total allowed active membership of the Academy, except by the unanimous consent of the Council.

By 1932 the number of scientists in the State had increased, interest in science in the secondary schools had been stimulated and the colleges had graduated numbers of teachers from the science departments. It began to be apparent that the membership of the Academy should be studied with the objective in mind of extending its influence to a much larger group. A committee was appointed to draft a new constitution which would reclassify members so as to permit all persons interested in science to be admitted but still adhere to the principles of ultimate control by a small group as planned by the Charter members. With the adoption of this constitution, with amendments, the second period in the history of the Academy was begun. This may be designated as Period II. 1932-1942. PERIOD OF GROWTH AND DEVELOPMENT.

The major events of this period will be outlined in a subsequent article for the bulletin.

W. B. BAKER, Historian.

*Voted to increase membership limit to 85.

**The eleven groups mentioned above.

CHARTER MEMBERS OF THE GEORGIA ACADEMY OF SCIENCE

List Compiled by Dr. R. C. Rhodes, Historian, 1948

Dr. G. H. Boggs, Chemistry, Georgia School of Technology.
Dr. T. P. Branch, Civil Engineering, Georgia School of Technology.
Professor L. M. Carter, Agricultural Chemistry, University of Georgia.
Dr. A. S. Edwards, Psychology, University of Georgia.
Professor T. W. Fitzgerald, Electrical Engineering, Georgia School of Technology.
Dr. C. R. Fountain, Physics, Mercer University.
Dr. Henry Fox, Biology, Mercer University.
Dr. B. M. Hall, Electrical Engineering, Atlanta, Georgia.
Professor E. S. Heath, Botany, Oglethorpe University.
Dr. L. L. Hendren, Physics, University of Georgia.
Dr. B. B. Higgins, Botany, Georgia Experiment Station.
Mr. B. W. Hunt, Horticulture, Putnam County.
Dr. S. W. McCallie, State Geologist, Atlanta, Georgia.
Dr. T. H. McHatton, Horticulture, University of Georgia.
Dr. W. S. Nelms, Physics, Emory University.
Professor J. B. Peebles, Engineering, Emory University.
Dr. J. M. Reade, Botany, University of Georgia.
Dr. R. C. Rhodes, Biology, Emory University

Dr. W. A. Shelton, Archaeology, Emory University.

Professor W. B. Skiles, Mathematics, Georgia School of Technology.

Dr. C. M. Snelling, Mathematics, University of Georgia.

Dr. R. P. Stephens, Mathematics, University of Georgia.

Dr. C. M. Strahan, Civil Engineering, University of Georgia.

Dr. H. P Stuckey, Director, Georgia Experment Station.

Dr. G. C. White, Psychology, Emory University.

Mr. H. C. White, Athens, Georgia.

THE PRESIDENT'S PAGE

F. Homer Bell

Please mark on your calendar the dates of April 15, 16 and 17, the dates when the Science Fair will be held on the campus of Oglethorpe University. If you have never attended a Science Fair, you will be astounded at the number and quality of the exhibits of the high school students. The sponsorship of the Junior Academy of Science and the Science Fair is a project of which the Georgia Academy can be proud. This alone would justify your support of the Academy.

The Thirty-first Annual Meeting of the Georgia Academy of Science will be held at North Georgia College on April 23 and 24. Papers will be presented on Friday. The Annual Dinner will be Friday night, April 23rd. A speaker of national reputation will make the address. Dahlonega is delightful at this time of the year. Make plans to attend and invite your wife (or husband) to accompany you.

Your president extends an urgent invitation to all members of the Academy in industry to participate to a greater extent in the activities. The Academy would be strengthened and its usefulness increased if the industrial members assumed a part in proportion to that of members in academic work. The other members will be interested to learn more about your particular line of work. You can present papers at the meetings, or if not, attend the meetings and take part in the discussions. Judges for the Science Fair are in demand and the matter of raising funds for prizes and scholarships is before us each year. The Georgia Academy has about 450 members. This can be increased to 1,000 and then include but a small proportion of "Residents of Georgia who are engaged in scientific work, or who are interested in the development of Science."

Large industries not only maintain a large research program but also contribute toward the education of students and support the educational institutions.

Westinghouse Electric Corp. sponsors 84 undergraduate scholarships and 137 fellowships annually. In addition, they sponsor six 4-H Club scholarships and 40 Science Talent Search scholarships.

General Electric Co. for the eighth consecutive year is offering a special six-weeks study program to 50 preparatory and high school physics teachers from the north central states.

Lockheed Aircraft Corp. is offering 20 scholarships for science study, valued at $5,000 each.

For the many companies who would like to set up a scholarship fund but do not have the facilities to place these funds properly, there is the Manhatten Council for Financial Aid to Education. A Businessman-Educator, Wilson Compton is President. The Administrative expenses and others of the commission will be met by a Foundation. The corporate gifts will be used for the benefit of high school graduates so that they may continue their education.

Sir Edward Appleton, principal of the University of Edinburgh and a Nobel Prize winner in physics has some inspiring thoughts in the BULLETIN OF THE ATOMIC SCIENTISTS, as reported in the January 4, 1954 issue of TIME. If "art for art's sake," why not "science for science's sake?" His thesis is "Science is illuminating as well as fruitful. Perhaps the most striking thing about modern science, is that like poetry, like philosophy, it reveals depths and mysteries beyond . . . and quite different from the ordinary matter of fact world we are used to.—The pursuit of science presents to the human mind an enduring challenge on an endless frontier, quite apart from the material enrichment of mankind to which it may incidentally give rise. . . ."

THE SECRETARY'S PAGE
RECENT ACTIONS OF THE EXECUTIVE COUNCIL

W. B. Redmond

It appears desirable to publish a brief account of the actions of the Executive Council, and of the business meetings, of the Academy of the last two years. Many changes have been made in an effort to improve the services of the Academy, and the Council and officers always welcome suggestions. With the exception of the first provision of which I do not have the date, the enactments date between December 7, 1951 and January 22, 1954. Several Constitutional amendments were made in the revised constitution as passed by the members at the business meeting on April 18, 1952 and previously published in the December 1951 issue of the Bulletin. These amendments are not included here except to call attention to some of the more important changes.

1. Old members who desire to be reinstated in the Academy and who have been out for some time may be reinstated by the payment of two years' dues.

2. It was recommended that the office of the Secretary-Treasurer be made into two offices and that an editor of the Bulletin be obtained.

3. The Council on April 17, 1952 recommended that the Junior Academy select a member of the Senior Academy to act as liasion officer between the Georgia Academy and the Junior Academy. This motion was tabled the next day at the business meeting.

4. The Council voted to retain ten copies of each number of the Bulletin in the files of the Secretary, to send three copies to Dr. A. S. Edwards and to place all remaining copies in the Library of the University of Georgia.

5. A new section (Section VI) on History and Philosophy of Science was established.

6. Provision was made for the ballots for election of officers to be counted prior to the time of the Annual Meeting.

7. The Council and the business meeting in 1952 adopted resolutions recommending conservation and preservation of flora native to the Stone Mountain area.

8. A Volume of the Bulletin is to consist of the numbers in a calendar year beginning with the January issue.

9. The officers are to take office at the end of the Annual Meeting and serve through the next Annual Meeting.

10. Should the President leave the state (as resident) the vice-president is to assume the duties of the president, and should both the president and the vice-president be unable to function it would be the duty of the secretary to call a meeting of the Executive Council and the council should appoint a chairman pro tem to serve until the next annual meeting.

11. When no section officers are elected by the members of the section the president is authorized to appoint such officers for the remainder of the year.

12. The secretary was authorized to appoint a committee for counting the ballots.

13. The council voted to recommend the affiliation of the Georgia Psychological Association. This to be voted upon by the members at the 1954 Annual Meeting.

14. The council recommended that a President-elect be added and that the president-elect assume the duties of president one (1) year after election. See constitution amendments in this issue.

15. The following amendments to the By-Laws were made at the 1953 Annual Meeting: Article III, Section 3. It shall be the duty of the Secretary to publish the Bulletin of the Academy, which Bulletin shall consist of one (1) volume composed of three or more numbers each year.

Article III, Section 4. It shall be the duty of the officers of each section to submit a written report of the activities of the section for publication in the Bulletin.

Article III, Section 5. All committees shall be dissolved along with the expiration of office of the outgoing officers at the end of the Annual Meeting.

Article VI, Section 5. (Sections 5, 6 and 7 becoming 6, 7 and 8). The annual dues shall become payable at the beginning of the calendar year.

16. The number of the Bulletin just prior to the Annual Meeting shall consist of the program of the Annnual Meeting.

17. The following criteria were made the basis for selection and nomination of fellows of the Academy:

1. Fellowship, or membership, in any national society having research qualifications for its members.

2. On recommendation of three (3) fellows of the Georgia Academy.

3. On recommendation of the officers of a section.

4. On recommendation of the secretary of the Academy.

5. Active interest and participation in the affairs of the Academy.

18. Members in good standing who have paid dues for 20 years, and who have been retired, shall be exempt from further payment of dues, such life members shall have all privileges of the Academy. A written statement to the secretary is necessary for exemption from payment of dues.

19. The Academy Improvement Committee shall be a permanent committee of the Academy.

20. A section (Section VII) on Science Education was established by the council. Mrs. Helene Lammers was named chairman of the section to serve until the Annual Meeting.

21. The pro tem committee for the Junior Academy should prepare a report for the next meeting of the Executive Council of the Georgia Academy stating the rules and regulations concerning the relations of the Junior Academy to the Georgia Academy and make recommendations of such constitutional amendments as are necessary.

22. In April 1944 the fourth weekend in April was established as the official time of meeting of the Academy.

"IF I COULD BE EIGHTEEN AGAIN"*

A. D. Hyde, Vice-President in Charge of Research, General Mills, Inc.

"If I could be eighteen again. . . ."

That's no new wish. It is a favorite of many who are no longer eighteen. The wish probably reached its ultimate expression when George Bernard Shaw grumbled that "The trouble with youth is that it's wasted on young people."

At any rate, if I were eighteen, I know what I'd be planning to do. I'd set out to explore the frontiers.

You say there are no more frontiers to explore? You've heard that there is no more unexplored land for eager, daring young men and women to conquer? Do you think our pioneering days are over?

Don't fool yourself. The day of the really visionary pioneer with important things to explore has just barely arrived. Our big discoveries are still ahead of us.

This familiar world of ours, old as it is, still clings to many secrets. You and I, together, can't begin to dream of all the wonders that are left to discover. There's lots and lots of elbow room left for our explorers.

But there is one catch . . . today's explorer is a brand-new variety. He is a skilled doctor, engineer, chemist, physicist, biologist—in short, a trained scientist with plenty of entnusiasm and imagination.

Yes, if I were eighteen I would be planning to go exploring in the world of science or engineering. And right now I'd be equipping myself for that adventure, moving ahead to get the tough, exacting special training which is so essential these days. A technical education is the only way to get the special tools necessary to work in the world of scientific research and development.

This education will equip you to take part in the exploring that is ahead of us. It is the exploring which, just since I was a youngster, has produced supersonic flight, television, atomic energy, and all the other modern miracles which we take for granted.

It also is the world which—very likely within our own lifetimes—will develop the power source which will replace our dwindling supplies of coal and oil . . . and find new ways of getting the metal ores we must have to feed our ravenous industrial hunger for steel and iron . . . and discover a cure for cancer . . . and produce ways and means of giving more people better and cheaper housing . . . and make automobiles safer . . . and improve the nourishment of the world's growing population.

Even all this gives only a sketchy view of what is ahead in research and development. I can't imagine

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*Reprinted from PROGRE3S THRU RESEARCH, a publication of General Mills, Minneapolis, Minnesota.

anything more exciting than planning to take part in it. There's so much to be done . . . but we must have the technically trained manpower to do it.

I know, of course, that not everyone is qualified either by interests or ability to get training in science or engineering. But many young people who are qualified don't get even as far as a high school diploma.

Only about one and one-half percent of this year's 18-year old crop will end up in the challenging, provocative world of science and engineering.

Why is this so? Certainly not because we lack young people with enough mental horsepower for college work.

I think one reason for this weak showing is simply a poor job has been done in telling young people about the opportunities which exist in research and development.

If you are one of those with ability and interest in science, think about preparing yourself for a career in that field. You'll need a college education—and this country is full of colleges which can do a first-rate job of giving you anything from arts background followed by specialized training to a straight technical education.

You'll find that college is expensive. The costs of maintaining and operating educational institutions have gone up in recent years. It costs more to live while attending college, too.

However, don't let the expense scare you away. You'll be surprised at the number of scholarships which can be had practically for the asking. Others can be won in various ways . . . you'll be smart to ask your high school principal about them. Later on, if you get into graduate work, you'll discover that more than half of today's graduate students have a teaching or research assistantship, or some other sort of fellowship or scholarship.

You'll also discover that you can earn good money during summer vacations. Many corporations now give students a chance to work in their laboratories during the summer. Work of that sort has the extra advantage of giving you a chance to see first-hand how industrial research is conducted. It's an education, itself, and you get paid while learning.

It has been said that the lucky combination of ability and adequate finances is usually necessary in getting a college education. This need not be entirely true. A lot depends upon your own initiative and ambition.

While you are getting your education, spend a little time finding out what people look for when hiring a scientist or engineer. I think you'll discover that technical competence is just part of the story. Men running our research and development laboratories want more than just a well-trained man or woman. They also want a man or woman who will fit in well, personality-wise, with the rest of the group. Research and development work is to a large extent teamwork, and you'll be expected to be a good team player. A friendly, cooperative personality is often as valuable in scientific work as straight "A" grades through four years of chemistry.

Having a son of my own who is just 18, I know firsthand a little bit about another problem which bothers 18-year olds. It's this business of military service, which to a young man, raises a serious problem. Should he, for example, start college this year perhaps to have it interrupted in a year or two by military service? Or should he get his service over with first? What should he do with this element of uncertainty clouding his future?

A lot of today's promising young engineers and scientists had the same experience not too long ago. I think most of them would say to start college training now, just as if the draft did not exist.

When and if called, chances are that the interruption will not be serious. It's easier than you may suspect to come back and pick up studies right where you left off. Veterans after World War II had consistently higher grades than they had received before the war. They also had higher grades than most non-veterans.

So don't let prospects of service upset and spoil your long-range plans. Current draft policies make it possible for many young men to finish their educations, anyway.

Recently the National Manpower Council made these recommenda-

tions in regard to student deferment:

1. That the policy of deferring qualified students until they complete their education receive public support.

2. That dependency be removed as grounds for deferment, in order to insure that postponement from service does not turn into permanent exemption.

3. That the President retain present provisions which permit qualified students in all recognized fields of study to be given equal consideration for deferment.

4. The President retain the present method by which students can qualify for deferment on the basis of either their score on the Selective Service Qualification Test or their class standing.

These four recommendations are part of the list. If the policy is followed, the prospect of military service should not discourage anyone from entering college for specialized training.

All indications are that there will be a long-continuing demand for scientists and engineers. I'm sure there will be a job waiting for the graduate of 1958. Today we have about 160,000 engineers and scientists in the United States. If that sounds like a large number, consider that right now there is a shortage of more than 60,000 engineers. Moreover, it is estimated that our need for new science and engineering graduates is in excess of 60,000 per year.

And what is the supply? Last June about 35,000 young men and women graduated to fill those 60,000 jobs. Next year it will be a little lower—about 30,000 graduates. The classes of 1955 and 1956 should be a little larger, particularly in such fields as chemistry.

But there is no indication that the supply—even if it increases—will begin to match the demand for many years to come. Industrial research and development have increased five times in the last ten years and government research has expanded even more than that. But during the same period the number of scientists and engineers has barely doubled.

The field is wide open for scientific explorers. Right now our big problem is that of finding enough people qualified to do the work. If I were eighteen again, I would be readying myself for a career in America's exciting research and development work.

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To conserve space the name of the state, Georgia, has been omitted. Where no post office is given ATLANTA is understood. Emory University and Oglethorpe University are post office addresses.

REPORT OF THE COMMITTEE TO STUDY COOPERATION OF THE ACADEMIES OF SCIENCE WITH THE ACADEMY CONFERENCE

Frank E. Germann, Chairman
Boston Mass. — Dec. 27, 1953

(This report is published with the permission of Dr. Germann and the officers of the Academy Conference. It explains the relationship between the state academies and the A. A. A. S.
—The Editor)

The following report will no doubt be more easily understood and its implications be more readily appreciated if a brief resume of the nature of the interrelationships between the American Association for the Advancement of Science, the various Academies, and the Academy Conference is given at the outset. This is all the more important since many of our number have never before participated in an Academy Conference meeting, and some of those that have may not have a clear concept of how our Conference came into being, or what its functions are.

The A.A.A.S. through its more than 100 years history has grown from 461 members in 1848 to some fifty thousand at the present time. What started as a simple organization has become through the years, one of great complexity. In addition to the nineteen or more sections and numerous subsections meeting regularly there are three major divisions which have been organized during the past forty years. These are the Pacific Division, the Southwestern Division and the Alaska Division. The constitution also provides for local branches, but there has been relatively little activity along this line. Then there are the Affiliated and Associated Societies, the only distinction in these being that the former have representation on the Council, whereas the latter do not. Prior to 1919 the Academies of Science operated as Associated organizations, but by a revision of the Constitution in that year Academies were given Council representation, and became known as Affiliated Societies. This active participation in the affairs of the Council soon led some of the leaders in the Academies to realize that, having common problems, some kind of cooperation between academies could be very beneficial. The idea was suggested to the officers of the A.A.A.S. in 1926 with the result that the Academy Conference was born in 1927, under the general sponsorship of the A.A.A.S.

It was the original hope of the officers of the American Association that the Academies would come to play the part of Local Sections of the A.A.A.S. and that thereby membership would be increased both in the Association and in the Academies. By fulfilling this double purpose, it appeared that the organization of scientific men and women in America would be more easily and expeditiously accomplished.

Our Conference has now been in existence for over twenty-five years and our committee has been asked to survey the present and possible future cooperation with our Academies. In our report given in St. Louis last year it was pointed out that we have not been too successful in our chief purpose partly because membership in the Conference has been in many if not in most cases on an annual basis, a different

person being appointed each year by the various Academies. Appointment has been made on the basis of the assumption that a given person would be in attendance at the meeting of the A.A.A.S. and accordingly could be the representative of the Academy at no expense. The situation is very much the same as if members of a city council were elected to participate in a single meeting.

We must therefore again emphasize, as we did in our report last year, that Academies should be urged to appoint delegates who can and will be active in the affairs of the Conference for a number of years. These appointees should also be persons who are ready and willing to sacrifice some of the A.A.A.S. sectional meetings which coincide in time with the Conference sessions. Some Academies are already paying part or all of the expenses of Conference delegates. Should this become a more general practice, there is no doubt that the delegates would begin to take a more serious and sustained interest in our work.

Some of our Academies carry the name of the Academy Conference representative as one of their officers and in several cases this delegate is also a member ex-officio of the Academy Executive Committee. In such cases the term of office is indefinite continuing until a successor is elected. This procedure insures that delegates know far in advance that they are expected to be prepared to go, and participate in, Conference meetings. However, in many cases the new Conference officers fail to realize that it is their duty to see to it that every Academy has appointed its delegate, well in advance, (a year if possible,) and that they should be supplied with the delegates name at an early date. If this were done, and the Conference Secretary had a tentative list of delegates before him far in advance of a given meeting, the question of preparing a suitable program for the annual meeting would be greatly facilitated.

It sometimes happens that the Academy Secretary is not interested in affairs beyond his own group. He may not even be a member of the A.A.A.S. and hence have no interest in the larger question of cooperation with others. Obviously in such cases the president of the Academy may never be informed about correspondence concerning the Conference. It would, therefore, seem advisable that Conference officers should send their requests for information to both the president and the secretary of the Academy, and if the Conference delegate is known, to him also. This lack of familiarity with the general make up of our various groups is emphasized by the fact that some academies do not recognize that the A.A.A.S. council representative may know nothing of the existence of an Academy Conference. They do not recognize the fact that they must appoint both a Council member and a Conference delegate. The Council member must be a Fellow of the A.A.A.S., but the Conference delegate need not even be a member of the A.A.A.S. They may appoint the Council member to serve also as the Conference delegate, but the Conference delegate may not serve as a Council member unless he is also a Fellow of the A.A.A.S.

In 1951 the Indiana Academy appointed a Conference delegate who was not a member of the A.A.A.S. When he found that most delegates were members of the A.A.A.S., he concluded that he was not a proper representative. The same year the Indiana Council member reported back that he attended the Council meeting in Philadelphia, but that nothing of immediate importance was noted insofar as the Indiana Academy was concerned.

For fear that the above involved explanations may have been unduly confusing we shall conclude by making the following suggestions:

1. Academy representatives to the A.A.A.S. Council, being of necessity Fellows, may also be appointed Conference delegates, but they should be specially advised of the nature of each group and their responsibilities for each set of meetings.

2. Academy Conference Delegates are not now required to be members of the A.A.A.S. and hence they may have no official connection with the affairs of the Association. It would be well if we required all delegates to the Conference to be A.A.A.S. members, and preferably Fellows.

3. It would seem wise for the Academy Conference to have a definite understanding that all of its officers be Fellows of the A.A.A.S.

4. We should urge every Confer-

ence Delegate to request time at his Academy meeting to present a brief resume of both the proceedings of the A.A.A.S. Council and of the Academy Conference. (Assuming that he is a member of both bodies.)

5. If the Academy has a periodic publication, efforts should be made to have the above reports published in it.

6. In my last report I stated that often the Secretary or the President of the Conference has arranged for the program with little or no help from the Conference membership. It has been suggested that a committee should be appointed to do this job, and thus leave the President free for broader functions.

7. During recent years our secretary has written to the Academies and has obtained significant information which was mimeographed and presented to us in a bound bulletin. Last year it was suggested that each Academy Conference Delegate give a brief report on the activities of his Academy at the Conference. The secretary has felt that this would make his report unnecessary. This, however is not necessarily true, since the reports are persented to somewhat different groups at different times and would be useful to supplement each other. One is a permanent record, whereas the other is oral, so there will be no real duplication.

8. Academy Conference programs should relate to Academy activities and problems. Delegates should be given something of value to take back to the home Academy. We should serve our true purpose, that of a Clearing House for gathering and disseminating information about academies. Lengthy papers, research reports, etc., not related to Academy activity should be minimized.

9. It has been suggested that each Academy secretary include with whatever notice he may send out to the membership during the autumn months a statement of the time of meeting of the Academy Conference, the name of the Academy delegate to the Conference, and an invitation to Academy members in general to attend the sessions of the Conference.

10. Academy secretaries should be asked to send their membership lists once each year to the Washington Office of the A.A.A.S.

11. The A.A.A.S. should be asked to send lists of its members residing in a given state to the secretary of the State Academy once each year. Such a mutual exchange of membership lists should serve to increase membership both ways.

AMENDMENT TO THE CONSTITUTION

At the meeting of the Executive Council on April 20, 1953 the motion was made that an additional officer, a President-elect, be added and that the president-elect assume the duties of the president one (1) year after election. The motion was seconded and passed by vote. In lieu of this amendment being ratified by the members the ballot for the 1954 election of officers will carry nominees for president-elect contingent upon the vote of the membership at the 1954 Annual Meeting.

If amended as indicated above the first sentence of Article IV, Section 1, should read: The officers of the Academy shall be President, Vice-President, President-elect, Secretary, Treasurer, and Historian. An additional sentence at the end of Section 1 should read: The President-elect shall assume the duties of the President one (1) year after election.

THE ROLE OF SULFHYDRYL COMPOUNDS IN THE REDUCTION OF TETRAZOLIUM INDICATORS*

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Since Kuhn and Jerchel (1941) first reported the reduction of substituted tetrazolium salts by living yeast and bacterial cells, there has been a wide application of these oxidation-reduction indicators in biological research (see reviews by Mattson, et al. 1947, Smith 1951). Tetrazolium differs from the majority of redox indicators since, in the reduced state, it forms an insoluble colored formazan and the reaction is, therefore, irreversible. The formazan

*Based upon a paper presented at the annual meeting of the Association of Southeastern Biologists, Chapel Hill, N. C., 1953. Details will appear in a forthcoming paper to be published in Stain Technology.

is not adsorbed, nor does it diffuse from the cell in which it was formed. The reaction is extremely sensitive and the colored reduction product is visible in minute quantities. Since the formazan is soluble in acetone the reaction is readily adapted to colorimetric quantitative determinations of enzymatic activity. Although most of the earlier research was conducted with 2,3,5-triphenyltetrazolium chloride (TTC), there is now commercially available a wide selection of both monotetrazolium and ditetrazolium substituted salts.

Several factors have been reported to be responsible for the reduction of the tetrazolium indicators in plant and animal tissues (Roberts 1951). Lines of evidence have indicated the possible roles of certain dehydrogenases requiring coenzymes I and II, flavin enzymes (yeast diaphorase, amino acid oxidases), lipids, and sulfhydryl compounds, in the reduction of these indicators. It seems likely, however, due to the lack of specificity for enzyme inhibitors (Fred and Knight 1949, Roberts 1951) that a general redox potential level, maintained by the operation of several physiologically active systems, brings about the reduction of tetrazolium indicators in normal plant and animal tissues.

In connection with a survey of plant tissues that reduce the tetrazolium indicators, preliminary experiments were conducted on the localization of sulfhydryl compounds. It was observed that, in certain plant tissues, there was a positive correlation between the reduction of the indicators and the histochemical localization of sulfhydryl systems. For example, the sulfhydryl pattern in tissue slices of *Zea mays* embryos was histologically identical with that of the TTC reduction pattern in these tissues. The specific sulfhydryl reagent 1-(4-chloromercuriphenylazo)-naphthol-2 (Bennett 1948) was employed in these studies. Although further experiments were conducted with reported sulfhydryl inhibitors (phenyl mercuric chloride, iodoacetate), the results were inconclusive in demonstrating the correlation between sulfhydryl and the tetrazolium reaction.

Other workers have observed a similar correlation between the localization of sulfhydryl systems and the tetrazolium reaction. Barrnett and Seligman (1952) reported a positive correlation between the reduction of blue tetrazolium and the localization of cyanide reduced sulfhydryl groups. Antopol and coworkers (1948) observed the in vitro reduction of neotetrazolium chloride by cysteine hydrochloride and reduced glutathione. Others workers (Antopol, et al. 1948, Roberts 1953) have observed an increased rate and intensity of tetrazolium reduction in tissues previously treated with cyanide. Antopol and coworkers (1948) have suggested that cyanide converts the disulfide linkage to the reduced sulfhydryl linkage and the latter, in turn, reduces the tetrazolium indicator.

A series of experiments were conducted to compare the in vitro reduction of several tetrazolium indicators by certain sulfhydryl compounds. The sulfhydryl compounds included 1% aqueous solutions of cysteine (free base), cystine, glutathione, and a commercial preparation of 2,3-dimercapto-1-propanol (BAL). Experiments were also conducted on the reducing effect of 1% aqueous solution of KCN on disulfide linkages as determined by the concomitant reduction of the redox indicators. There was considerable variation between the sulfhydryl induced reduction of the indicators. In general, the ditetrazolium (neotetrazolium) salts were more readily reduced than the monotetrazolium derivatives. The results of these experiments, using identical substrates, clearly indicates the error of making histological comparisons of different indicator reactions. Although the reduced sulfhydryl compounds (cysteine, BAL) readily reduced the majority of the indicators, oxidized sulfhydryl compounds (oxidized glutathione, cystine) did not reduce the indicators. However, if the oxidized sulfhydryl reagents were first treated with a 1% aqueous solution of KCN the indicators were reduced. Thus:

$$2\,RSH \xleftrightarrow{CN} RSSR + 2H$$

reduced sulfhydryl — oxidized disulfide

It is interesting to note that several workers have observed an increased rate and intensity of tetrazolium reduction in tissue sections previously treated with cyanide. For

example, the author has observed a greatly increased rate of neotetrazolium chloride reduction in cyanide treated nodal stem sections of *Acer. spp.*, *Phaseolus vulgaris* root tips, and *Zea mays* embryo sections. Although this does not minimize the role of other reductases, it is likely that this increased intensity of reduction is brought about by cyanide reduced sulfhydryl systems.

Preliminary experiments have been undertaken in an attempt to correlate the histochemical localization of sulfhydryl groups in nodal stem sections of *Acer spp.*, as indicated by the new sulfhydryl reagent 2,2′-dihydroxy-6,6′-dinaphthyl disulfide (Barrnett and Seligman 1952), with the tetrazolium reduction pattern in these tissues. Previous unpublished research by the author has indicated sulfhydryl systems may play an important role in the pathway of seasonal cambial reactivation in the stems of higher plants.

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MOSQUITO TRANSFER OF THE PIGEON STRAIN OF PLASMODIUM RELICTUM TO SQUABS[1]

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The failure to find an insect vector of the 1P strain of *Plasmodium relictum* has undoubtedly limited the use of this parasite and host in experimental studies on malaria. Both Coatney (personal communication) and Redmond (1944) failed to obtain infections in pigeons following attempts at mosquito transfer, but Redmond was able to obtain mosquito transfer from canary to canary. Huff (1951) reported a slight parasitemia in a few pigeons following sporozoite injection. The strain was originally isolated from young pigeons removed from the nest. Extensive examinations have failed to find the infection in adult birds. Due to the method by which the young pigeons are fed, there is a probability that the infection could be transferred from parent to young through the "pigeon milk," the secretions from the wall of the crop. This investigation was undertaken to test the feasibility of this method. Breeding pairs of white Carneaux pigeons were obtained and subsequently infected by blood inoculation, generally only one of the pair being infected at one time. In this way, it was possible to check the possibility of transfer at various stages of the patent infection as well as of the latent infection. From two to four broods were obtained from each pair.

Results

A total of 37 squabs were examined having one or both parents infected with malaria. No parasites were found in the blood of these young pigeons, either by microscopic examination of stained blood smears

1. This work was made possible by grants from the University Center Research Fund and from the Dazian Foundation for Medical Research.

2. Present location: Tuberculosis Research Laboratory, VA Hospital, Atlanta, Georgia.

or by subinoculations into uninfected birds.

Periodic examinations of the adult birds with latent infections showed no recurrence of parasitemia during the nesting or feeding periods.

Mosquito transfer to young pigeons. Having failed to effect transfer of the malaria parasites from the adult birds to the squabs through the pigeon milk at feeding, a further attempt at mosquito transfer was made. A strain of *Culex pipiens*, known to be a good malaria vector, was obtained from Dr. Martin Young, Columbia, South Carolina. At various times, different groups of female mosquitoes were allowed to feed either on infected female canaries or on infected squabs. The engorged mosquitoes were isolated and kept over moist filter paper. They were fed raisins, boiled briefly in sugar water. After 12 to 14 days they were again allowed to feed on young uninfected pigeons varying in age from 4 to 8 days. After the second feeding, the mosquitoes were dissected and the salivary glands macerated in saline and injected into other pigeons of similar age. In all, 6 young were injected or bitten by mosquitoes that had been exposed to infection. Only one, Squab Number 5, became infected. This bird was 8 days old when injected with the macerated salivary glands of mosquitoes which had previously fed on an infected canary. Two squabs were exposed to mosquitoes which had previously fed on infected squab and one was exposed to mosquitoes which had fed on an adult pigeon infected with the mosquito transfer strain of Squab Number 5. Neither of these three birds showed any parasites. Two other squab were bitten by a total of 10 exposed mosquitoes. No infection resulted.

Squab Number 5 maintained a patent parasitemia for 32 days, until death. The infection was transferred to two other young pigeons, both of which died as a result of the infection. In the meantime, it was transferred by blood inoculation to adult pigeons, resulting in infections similar in every detail to those of the parent strain. None of the adult birds died as a result of infection.

To date the mosquito-squab strain has been transferred to 12 adult birds in some of which the infection became latent. Afterwards the latent infection was transferred to other birds which developed good infections.

Discussion

The parents of Squab Number 5 carried latent infections, consequently there is no definite means of ascertaining that the infection in Squab Number 5 was mosquito transmitted. However, no parasites were found previous to injecting the macerated glands and the infection appeared after the normal incubation period following the injection. Three young of two previous hatches of the same parents had shown no evidence of infection. These facts indicate that mosquito transfer to a young pigeon was apparently effected. Unfortunately, it was impossible to continue breeding the pigeons and the experiments had to be terminated.

This demonstration of transfer of the 1P strain of *P. relictum* does not solve the problem of how the infection is transmitted naturally, outside the laboratory. The previous transfer of the 1P1 strain from canary to canary (Redmond 1944) by mosquitoes and the present successful transfer from canary to squab indicates that there is no lack of potency in the gametocytes. Microscopic examinations of stained blood smears of the infected birds show the normal ratio of micro-and macrogametocytes. Exflagellation has been observed repeatedly. These indications point to the blood (or tissues) of the adult pigeon as containing the factors responsible for the failures to effect transfer by mosquito from adult pigeon to adult pigeon. It would have been interesting to have attempted infection of young pigeons with the 1P1-1 strain (Redmond 1944) by blood inoculation, but unfortunately this strain was not available at the time of the present tests.

It is apparent that this strain of *P. relictum* is not very widespread as few, if any, surveys have shown it to be among the blood parasites reported from pigeon blood. This fact may indicate that the infection has very little chance of transfer. In the few instances in which it is transferred, the young birds are likely the hosts, the infection becoming latent by the time they reach adulthood. Several squabs were inoculated by blood transfer and sur-

vived the infection, in contrast to the two squabs inoculated with the mosquito-squab strain, both of which died of the infection. These numbers are too few to be conclusive, however.

Summary

Transfer of the 1P strain of *P. relictum* by means of the pigeon milk was not effected in 37 squabs which were the offsprings of infected adult pigeons.

One infected squab was obtained following injection of macerated salivary glands of mosquitoes exposed to infected canaries.

Three young pigeons inoculated with this strain died of the infection.

When transferred to adult pigeons, the mosquito-squab strain showed all the characteristics of the parent strain.

Grateful appreciation is expressed to Mr. Joe Bussey for facilities and help in raising the pigeons necessary for carrying out these experiments.

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